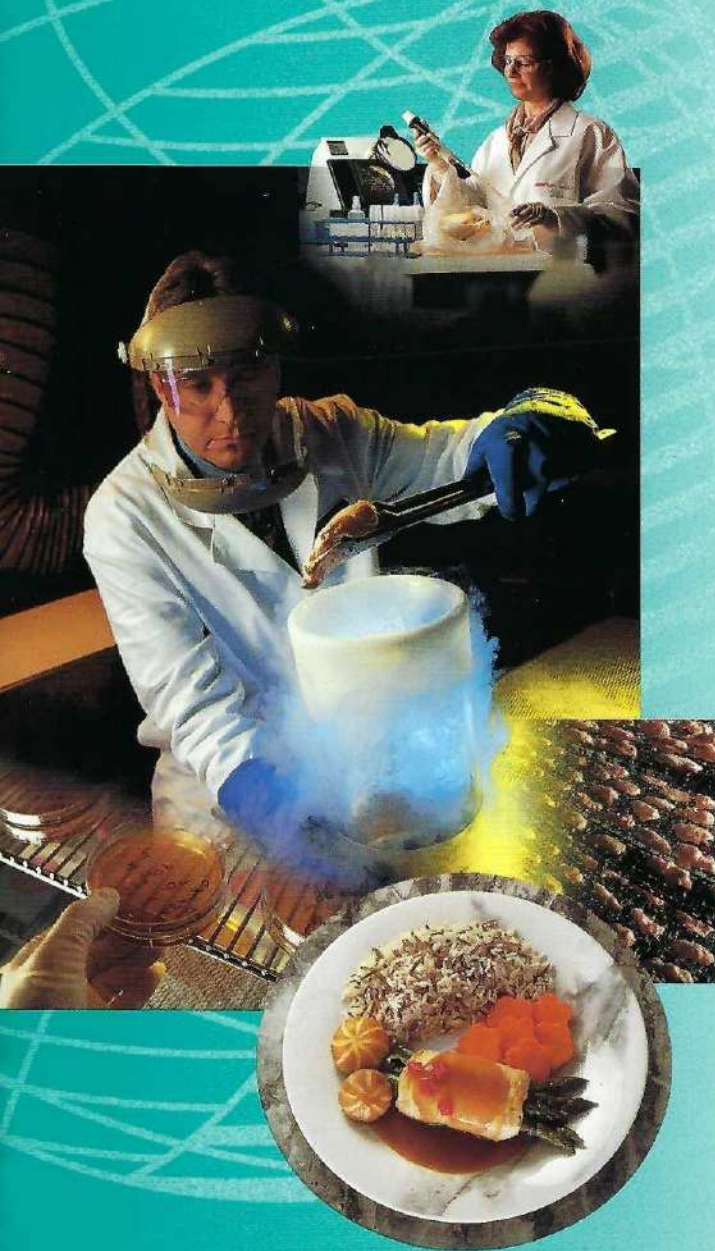
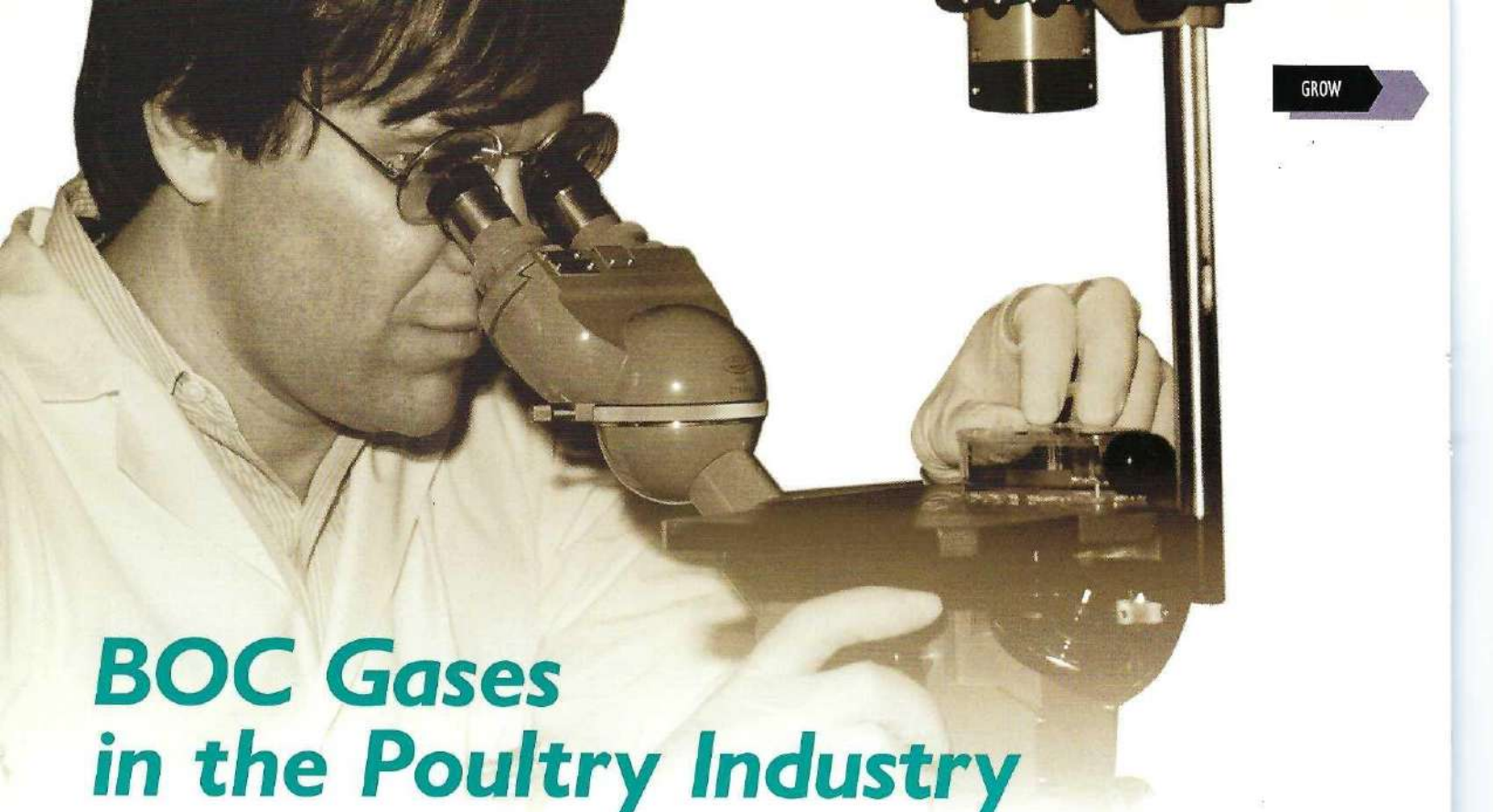


**FOOD SAFETY
AND
PRESERVATION
SOLUTIONS
FOR THE
POULTRY
INDUSTRY**





BOC Gases in the Poultry Industry

*Improving your yields, streamlining your processes
and enhancing your product quality with advanced
food safety and preservation technologies.*

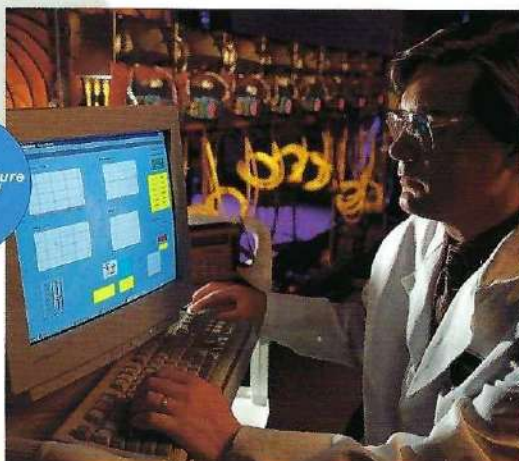
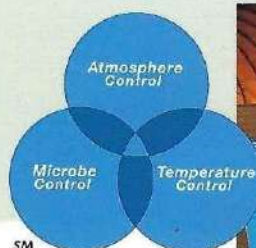
*BOC partners with industry leaders and top
researchers to bring you innovative technologies
such as the new Macron™ Loop system for water
disinfection and reuse. The industry unique Combo
Chiller and the highly efficient Fluidized Bed
Freezer are products of our own research center.*

Meeting your challenges

Against a backdrop of stricter food safety regulations, increasing water costs, labor shortages and shrinking profit margins, poultry processors are challenged to remain competitive and profitable into the year 2000 and beyond.

For more than three decades, BOC Gases has been providing innovative solutions for these and other processing issues—always by partnering closely with our customers and using our extensive research and development resources to respond to their specific needs.

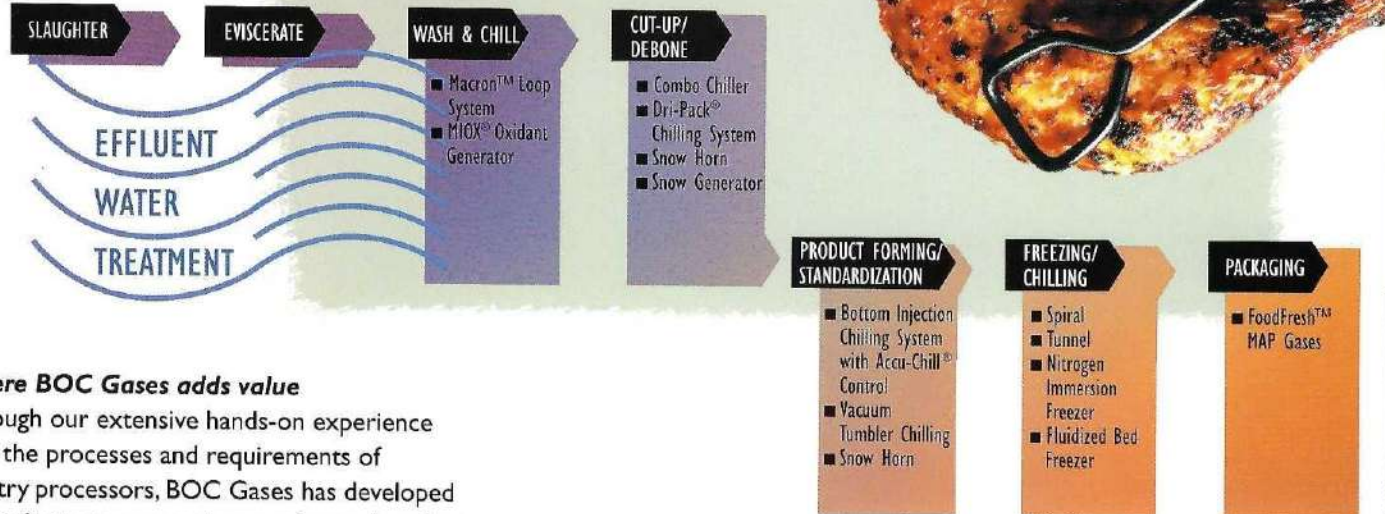
As the global leader in providing advanced food safety, chilling and freezing solutions to the poultry industry, BOC Gases is uniquely qualified to meet your most pressing needs. Whether you are looking to respond to a complex regulatory environment, boost your productivity and profitability, achieve the utmost in product quality or reach new levels of product and environmental safety...you can count on BOC.



STUNNING

- Controlled Atmosphere Stunning

POULTRY PROCESSING PLANT OVERVIEW



Where BOC Gases adds value

Through our extensive hands-on experience with the processes and requirements of poultry processors, BOC Gases has developed technologies to support every phase of poultry processing, water recycling and disinfecting, packaging and distribution. Food science experts will work with you to best define your needs. Then BOC will offer you a 'total' solution—systems that integrate leading edge technologies with reliable and cost-effective gas supply. BOC Gases can provide comprehensive solutions for:

■ Cryogenic chilling

Our cryogenic solutions use carbon dioxide and nitrogen gases to quickly reduce the temperature of product—either to improve processing or as a means of preservation. Our flexible cryogenic systems are easy to install, efficient to maintain and provide consistent processing temperatures to help maintain product quality.

■ Cryogenic freezing

Compared to alternative freezing systems, our highly efficient liquid nitrogen and carbon dioxide freezing systems minimize freezing costs and help maintain product quality. The remarkably fast freeze preserves cell structure, minimizes dehydration and drip-loss and improves product safety. What's more, the simplicity of the equipment reduces overall maintenance and operation costs, while providing high-output in limited space. BOC continues to lead the cryogenic freezing market with innovative products like the highly efficient Fluidized Bed Freezer.

■ Cryo-mechanical freezing

BOC can lock in valuable moisture and help boost production by placing our cryogenic equipment with your existing mechanical refrigeration system.

■ Water recycling and disinfecting

The BOC Gases SafeQuest™ family of products is designed specifically to improve food safety and reduce water consumption in poultry plants. The first two SafeQuest-related products, our patented ozone-based Macron Loop system, and the MIOX oxidant generator, can significantly reduce water consumption and cross-contamination in chiller baths and other processing water.

■ Wastewater treatment

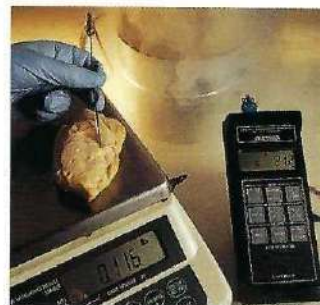
BOC is a global leader in wastewater treatment across a wide range of industries. BOC can supply food processors with carbon dioxide to replace mineral acids for pH adjustment and oxygen for reducing biological oxygen demand (BOD) of effluent. In addition, we can supply ozone technology for disinfection and chemical oxygen demand (COD) reduction of effluent.

■ Poultry stunning

BOC Gases has conducted extensive research into poultry stunning to improve yields, protect product quality and help reduce animal welfare concerns. We offer an innovative gas-based stunning technology for poultry producers, and we work with several equipment companies to integrate with your poultry handling systems.

■ Packaging

For improving shelf life, as well as product appearance, quality and taste, BOC Gases has developed a wide range of FoodFresh™ Modified Atmosphere Packaging (MAP) applications for your entire line of poultry products.



BOC Gases: Proven Expertise in the

BOC GASES

BOC Gases works with poultry processors worldwide, delivering innovative food safety and preservation solutions

CHILLING

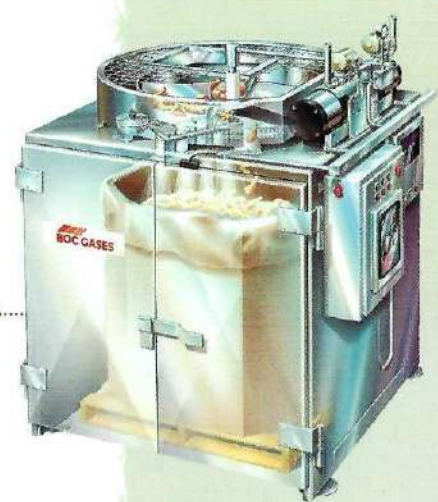
Cryogenic chilling of fresh poultry and other products for further processing

Automated combo chillers, bottom injection CO₂ chilling systems and snow generators for precise and consistent chilling of poultry



Combo Chiller

- Rapidly chills meat in combo bins to precise and consistent temperature profile throughout bin
- Uniform product distribution within bins
- Efficient use of CO₂ as chilling agent lowers operating costs
- Production rates to 15,000 lb/hr (6,800 kg/hr)
- Integral exhaust system ensures compliance to OSHA concentration thresholds



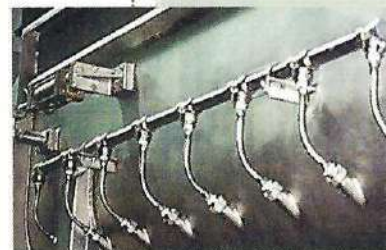
Dri-Pack® Chilling System

- Automatic and instant chilling of product in boxes with CO₂ snow
- Precisely and consistently places CO₂ snow in boxes—no snow overflow
- Adjusts to varying box sizes and heights
- Adapts to existing conveyor lines
- Simple controls



Bottom Injection Chilling System with Accu-Chill® Control

- Bottom injectors assure rapid temperature pull-down. Nozzles welded to blender base with clean-in-place (CIP) availability
- Highly efficient use of cryogen; uses BTUs from CO₂ liquid and vapor
- CO₂ injection automatically controlled
- Consistent product temperature within a batch and from batch to batch, improves downstream processing



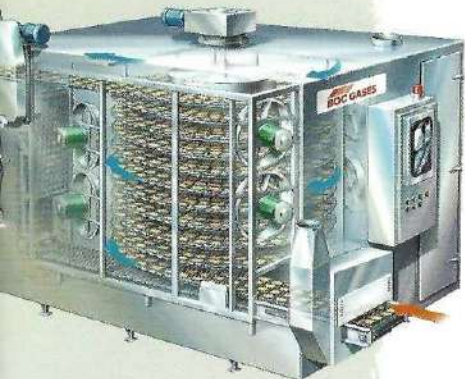
Vacuum Tumbler Chilling

- Increases marinade retention
- Higher quality product, greater consistency and higher yield
- Efficient cryogen shortens processing time
- Applying nitrogen or CO₂ snow brings meat to optimum tumbling temperature
- Increases yield



Most Demanding Food Businesses

PRODUCTS



Spiral Freezers

- 1,000 to 10,000 lb/hr (450 to 4,500 kg/hr) in a small-footprint unit
- Spiral product path saves floor space
- Modulating injection and exhaust reduce cryogen usage (CO₂ or N₂)
- Precision air flow improves efficiency
- Extra insulation saves cryogen
- Simple push-button control
- Proven reliability



Tunnel Freezers

- Versatile, economical freezing... with top quality product
- Modular 10-foot (3 meters) units: expand to 50 feet (15 meters)
- Uses either CO₂ or N₂
- Enhance airflow for maximum heat transfer
- Easy clean-up
- Low-cost acquisition, low-cost operation



Fluidized Bed Freezer

- For high-volume IQF
- Up to 65% more efficient than other freezers
- Immersion (N₂) or impingement (CO₂) step freezes outer surface of product for locking in moisture and quality
- High-velocity vapor completes the freeze
- No clumping, no sticking of product
- Minimizes removal of refrigerated plant air
- Footprint in 39 (3.62 sq meters) or 77 sq ft (7.15 sq meters)
- Easy to install, easy to operate, easy to maintain
- High production rate 3,000 lb/hr (1,350 kg/hr) and 6,000 lb/hr (2,700 kg/hr)



Nitrogen Immersion Freezers

- Simple, reliable, trouble-free freezing
- Rapid crust freeze in liquid nitrogen bath locks in quality and moisture, improving yield
- Quick start-up and trouble-free operation
- Accurate, automatic control of liquid nitrogen bath ensures precise freeze
- Simple maintenance and operation with minimal moving parts
- Hydraulic belt lift provides total access for easy cleaning

FREEZING

Cryogenic freezing of poultry products

Economical in-line cryogenic Tunnel Freezers, space-saving Spiral Freezers, fast Immersion Freezers, and Fluidized Bed Freezers for IQF and difficult-to-handle product

Cryo-mechanical freezing

Crust freezing with a cryogenic unit will lock in moisture. Cooked poultry product typically loses 2-5% in mechanical spirals. Cryo-mechanical systems reduce losses to 1/2 to 1 1/2%.



WATER RECYCLING

Macron Loop System for process water disinfecting and recycling

A patented technology that can significantly reduce cross-contamination in chiller baths and other processing water. A combination of two-stage filtering and disinfection with ozone.

MIOX® technology for water recycling

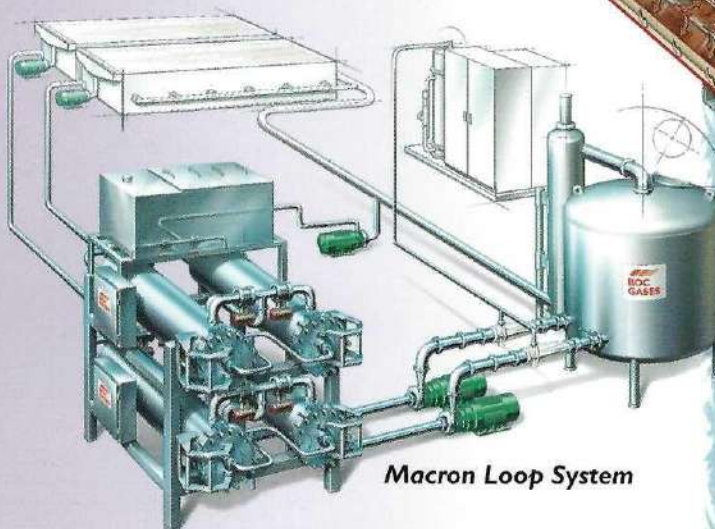
A technology that can eliminate the need for toxic gases and hazardous chemicals.



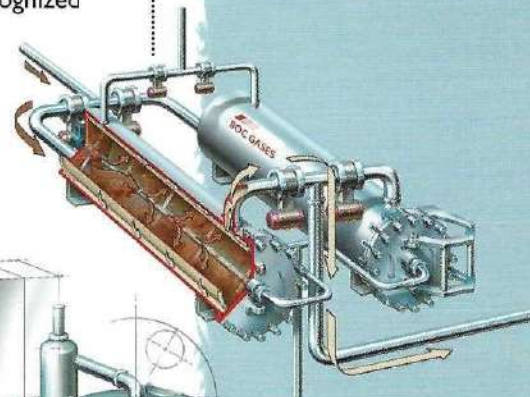
Macron Loop System

Ozone-based system filters, disinfects and recycles water in chiller baths and other poultry operations

- Macron filter eliminates organics and reduces chlorine additives
- USDA approved for use in ozonation method of disinfecting process water
- Ozone has been accorded "Generally Recognized As Safe" (GRAS) for use with food
- Ensures HACCP compliance
- 800 gallons per minute or more recycling capacity (3,000 liters/minute)



Macron Loop System



Patented Macron Filters

MIOX automated on-site mixed oxidant generator

A proprietary technology from Los Alamos Technical Associates, Inc., that produces and maintains chlorine residuals for improved food safety in the immersion chiller and other poultry process water. MIOX on-site oxidant generators use a membraneless electrolytic cell to produce liquid streams of mixed oxidants that produce chlorine residuals, eliminating the need to use toxic gases or hazardous chemicals.

- Proprietary membraneless electrolytic cell technology
- Chlorine is produced by a simple, cost-effective on site generator
- Uses only salt; no toxic gas or hazardous chemicals produced
- Minimal training required
- Can be used in combination with the BOC Gases Macron Loop System
- USDA Approved
- BOC is authorized marketing agent in North America



CA STUNNING

Controlled Atmosphere Stunning

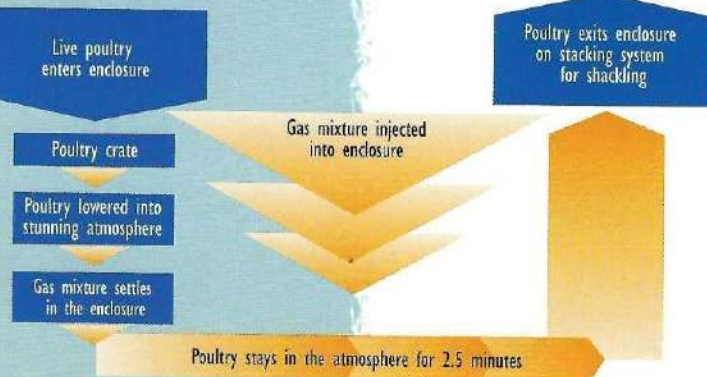
The quality and yield of poultry meat can be improved by ensuring that poultry is killed as quickly and painlessly as possible.

A gas mixture of 2% or less oxygen content, an inert gas such as argon or nitrogen and up to 30% carbon dioxide, does an effective, painless job of stunning. Poultry is rendered unconscious and insensible to pain and without the bone breakage and muscle damage caused by traditional electric shock.

Process benefits

The benefits of controlled atmosphere stunning include:

- **Increased yield**
Because of the reduction in downgraded meat
- **Better animal welfare**
Poultry is not handled until dead and suffers no distress in the stunning process
- **Enhanced meat quality**
There are significantly fewer broken bones and hemorrhaging is reduced in the breast muscle
- **Early carcass filleting**
Carcasses can be filleted early without any loss in quality
- **Efficient handling**
Reduced processing labor and more poultry per hour
- **Improved operator welfare**
There is less dust and operators handle only immobilized poultry



CA Stunning Process



Ask BOC Gases

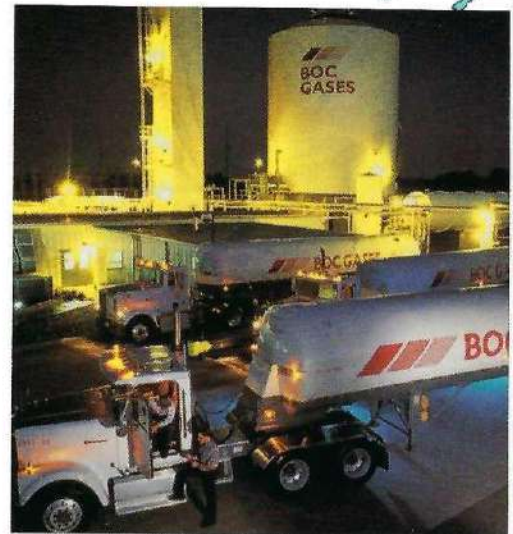
BOC Gases is the industrial gases company of The BOC Group, a \$6.5 billion multinational corporation with more than 40,000 employees in 60 countries.

A world leader in technology-based solutions for food safety and preservation, BOC Gases serves the food industry from harvest and storage through plant processing and distribution services. More than just a "gases supplier," BOC offers the broadest lines of freezing, chilling and food safety solutions in the industry. Using proven technology while continuing to innovate, BOC can provide a total solution for more profitable poultry processing or enhance efficiency in any specific process area you choose.

In addition to our own staff of engineers and researchers, BOC partners with expert consultants, allied equipment manufacturers and top food scientists at leading universities to find innovative, practical solutions to our customers' problems.

The result is cutting-edge technology and superior process performance backed by the resources, reliability, service, support and global presence of a world leader in gases and gas systems.

To learn more about these and other preservation and safety systems for your food processing applications, ask your BOC Gases Representative or call (800) 742-4726.





BOC Gases is a trading name used by operating companies within
The BOC Group, the parent company of which is The BOC Group plc

The BOC Group can be found on the Internet at <http://www.boc.com>

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